

east Australia, being dry land during the latter part of the Mesozoic period. We have nothing to show us that the lands were connected then, except the present similarity of the fauna and flora, which I hope to deal with at some future time. Let it be well borne in mind, however, that the similarity or identity of a fauna and flora is not a proof that the lands were formerly continuous. This similarity may arise from many independent causes, which I need not specify.

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ART. XIII.—*An Improved Grab Crane.*

BY C. W. MACLEAN.

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THE system of dredging by means of a bucket formed of two hinged scoops or forks, known as grabs or clam-shells, having mechanical contrivances for opening and closing by chains worked by a derrick crane in such a manner as to grapple and lift spoil, has long been known and used by engineers on the Continent, India, Great Britain, America, and other parts of the world.

Having observed several defects in the working of the usual forms of grab cranes, I designed a new grab and crane which effectually overcomes these defects, and which I will now proceed to describe, prefacing the description by an extract from my British patent specification:—

“My improvements in grabs relate to the contrivances through which the grappling portion receives its necessary motions of opening, closing, hoisting, and lowering. The improvements in the contrivances used for working the same consist, first, in the substitution of a counterbalance barrel, supported and running in racks at the back of the crane, for the ordinary counterbalance weight, and in so arranging such counterbalance barrel that it assists instead of retards the engine in all the operations of working the grab ;

and, second, in a modified construction of crane for working my grab, by which it is made a portable machine."

The sketch shows the grab crane, which has pivoted jaws, *a a*, and connecting links, *b b*, similar to the ordinary grab; but the crosshead and shaft of the ordinary grab are combined in one shaft, *n*, which is capable of a vertical motion between guides in a frame, also of a rotary motion, and is supplied with a barrel, *o*, and two smaller warping barrels, *p p*. The larger barrel has two lifting chains, *q q*, which are at one end wrapped round and fastened to it, then led over two jib-head sheaves to two chain pulleys, *r r* (one close to each cheek of the crane), which are capable of being revolved by the hoisting engines, or of being stopped by a brake; thence by a series of guide pulleys to the rolling counterbalance barrels, *s s*, round which they are wrapped and fastened. The main barrel of the grab has also a lowering chain, *v*, wrapped round it in the opposite direction to that of the lifting chains, and led over a jib sheave to a barrel, *t*, which is capable of being put into gear and revolved by the hoisting engine, or stopped by a brake by the action of one lever acting on an eccentric and friction wheel. The two warping barrels have each chains, *x x*, the ends of which are wrapped round and fastened to them and to a fixed point, *w*, of the framing at the pivots of the jaws in such a manner that when the lifting chains, *q q*, are pulled by the engine the bucket closes, and when the lowering chain, *v*, is pulled the bucket opens. Two rolling counterbalance barrels, *s s*, which have the ends of the lifting chains attached to their circumferences, are fixed to a shaft, having pinions shrouded to their pitch lines, keyed to each end, which are free to roll down or up inclined shrouded racks as the lifting chains are either pulled or let out by the engines, and at the same time coiling or uncoiling the chains on their outer circumferences in a self-acting manner.

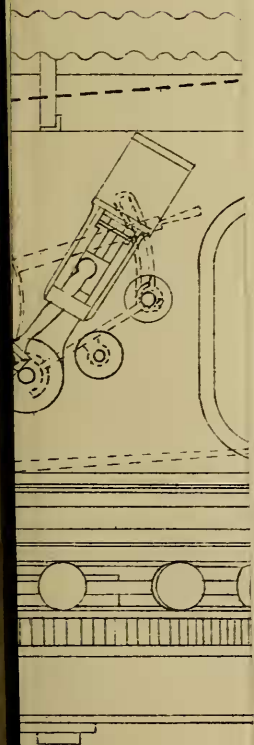
By this new machinery, which I have endeavoured to describe, the various operations of closing, digging, hoisting, opening, lowering, and partly counterbalancing the grab jaws, are effected in a novel and improved manner, as follows:—

Assuming that the grab is resting in the open position on the material to be lifted, the grab is then closed by putting the chain pulleys, *r r*, into gear with the engines, and thus pulling the lifting chains, *q q*, which, being wound round the main barrel of the grab, causes the warping barrels, *p p*, to revolve and drag down the shaft, *n*, by the warping chains

winding round their respective barrels. During this operation of closing and digging, the counterbalance barrels, *s s*, take in the slack of the two hoisting chains, and assist, instead of retard, the engine while performing the operation. The engines by continuing to pull the lifting chains, after the jaws are closed, raise the grab with its load, the counterbalance barrel still taking in the slack of the lifting chains, and assisting the operation of hoisting. When the grab has attained the required height the brake is applied to stop the lifting chain pulleys on the crane, the engines being at the same time disengaged. The engines are next engaged to pull the lowering chain, *v*, which being wound round the larger chain barrel, *o*, on the grab, causes it to revolve, thus unwinding the warping chains from their respective pulleys, and dragging up and opening the grab jaws. When the grab is opened the lowering chain is held by its brake, and the grab remains open, partly suspended by the lowering chain and partly by the lifting chains. The grab can now be lowered by the pressure being slightly taken off the lowering chain brake.

Having gone through these operations, it will be observed that, unlike other machines for effecting a similar purpose, the digging of the grab in any material is not interfered with by the counterbalance, which assists, instead of retards, the engines in performing this operation; while the whole weight of the grab bears on the points, and enters the material to be lifted. In other machines the grab cannot be raised open, but in the machine just described the grab jaws can be opened by the opening chain when the grab is in any position whatever, and the grab can be raised while open to any required height. Again, in other machines when opening the grab the load is suddenly transferred from the lifting to the lowering chain, which throws a severe strain on the chains and other parts of the crane; but in this machine the load is discharged while all the chains are taking part of the strain, and there is no sudden strain put at any time on them. Another advantage is gained by having two lifting chains, either of which will continue the work should the other break, and when they are both at work they prevent the grab from swinging and twisting the chains, which goes on to some extent in other machines. The weight of the barrel shaft of the grab tends to close the jaws.

GRAB CR.



*Elevation.*